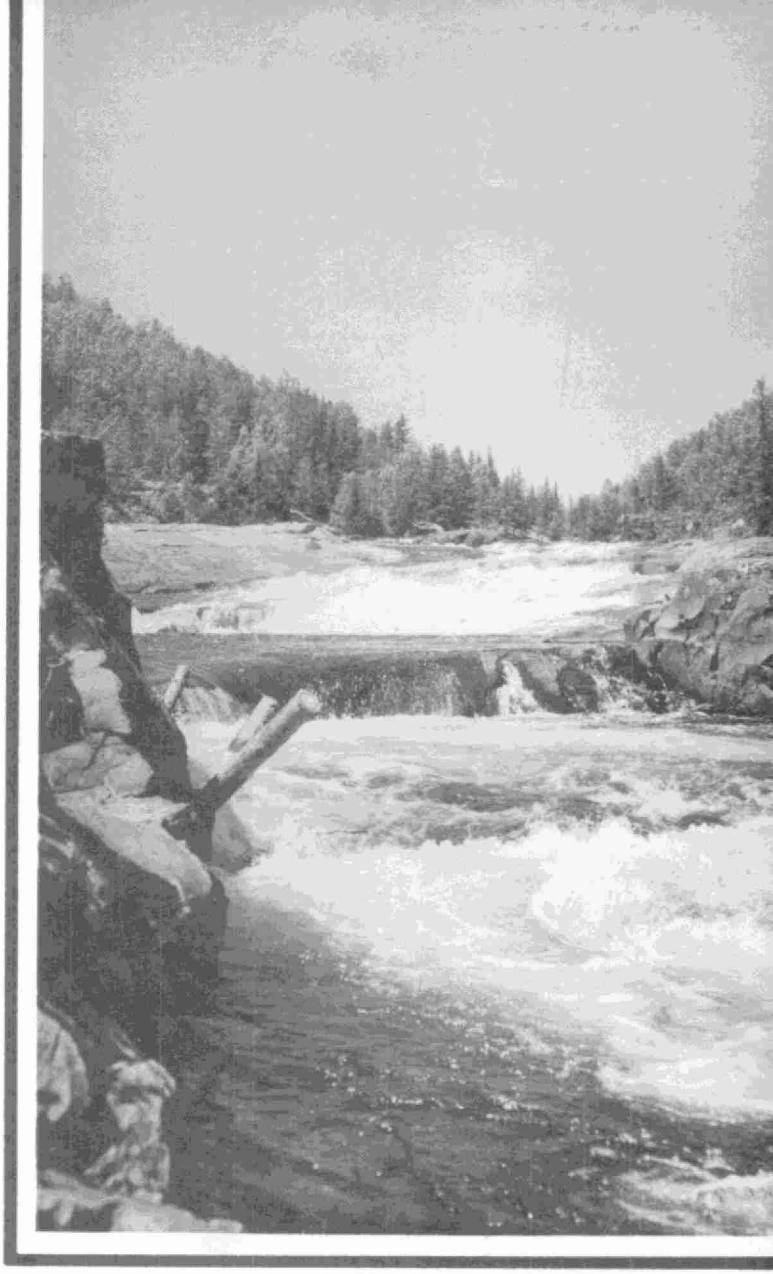
Waterloo Sewage Treatment Plant



1963 Annual Report

Ontario Water Resources Commission

ONTARIO WATER RESOURCES COMMISSION

OFFICE OF THE GENERAL MANAGER

Mayor and Members of Council,
City of Waterloo.

Gentlemen:

I am pleased to submit, for your information, the 1963 Annual Operating Report of the Waterloo Sewage Treatment Plant, OWRC Project No. 58-S-22, which has been prepared by our Division of Plant Operations.

We are grateful for the kind cooperation which you and your staff have extended to our Operations staff throughout the year. We look forward to a continuing close association with you in our mutual endeavour to control pollution.

Yours very truly,

D. S. Caverly,
General Manager

General Manager,
Ontario Water Resources Commission.

Dear Sir:

It is with pleasure that I present to you the Annual Report of the operation of the Waterloo Sewage Treatment Plant, OWRC Project No. 58-S-11 for 1963.

This report presents design data, outlines operating problems encountered and summarizes in tables, charts and graphs all significant flow and cost data.

Yours very truly,

B. C. Palmer,
Director,
Division of Plant Operations.

foreword

This report is designed to present the highlights of the operation of these works during 1963. Trends in flows and other operating data can be extremely useful in the development of necessary long range enlargement and improvement programs.

In addition to the activities reported herein, much unrecorded effort has contributed to the success of this operation. The municipality, through representatives on the Local Advisory Committee, has given valuable assistance in reviewing salary schedules, detailed operating budgets, personnel problems, flow patterns, and major maintenance problems.

The Division of Plant Operations has provided direction to the field staff in administrative procedures, quality control, maintenance schedules, equipment inspection and purchase supervision. A number of other Divisions of the Commission have been of service. The Division of Construction has offered helpful advice on equipment selection and renovation problems. The Division of Sanitary Engineering has maintained, through its District Engineering staff, a keen interest in the operation and has made a number of constructive recommendations. Its operator training courses have been very helpful. The Division of Finance has processed many payrolls, purchase orders and invoices dealing directly with this project. The Commission Personnel Director has been most helpful in the selection of new staff.

The excellent cooperation of all of these groups is gratefully acknowledged.

B. C. Palmer,
Director,
Division of Plant Operations

ONTARIO WATER RESOURCES COMMISSION

DIVISION OF PLANT OPERATIONS

contents

Foreword..... Page 1

Aerial view of plant..... Page 2

History..... Page 3

Project Staff..... Page 4

Description of Project..... Page 5

Design Data..... Page 7

Plant Flow Chart..... Page 8

Process Data..... Page 9

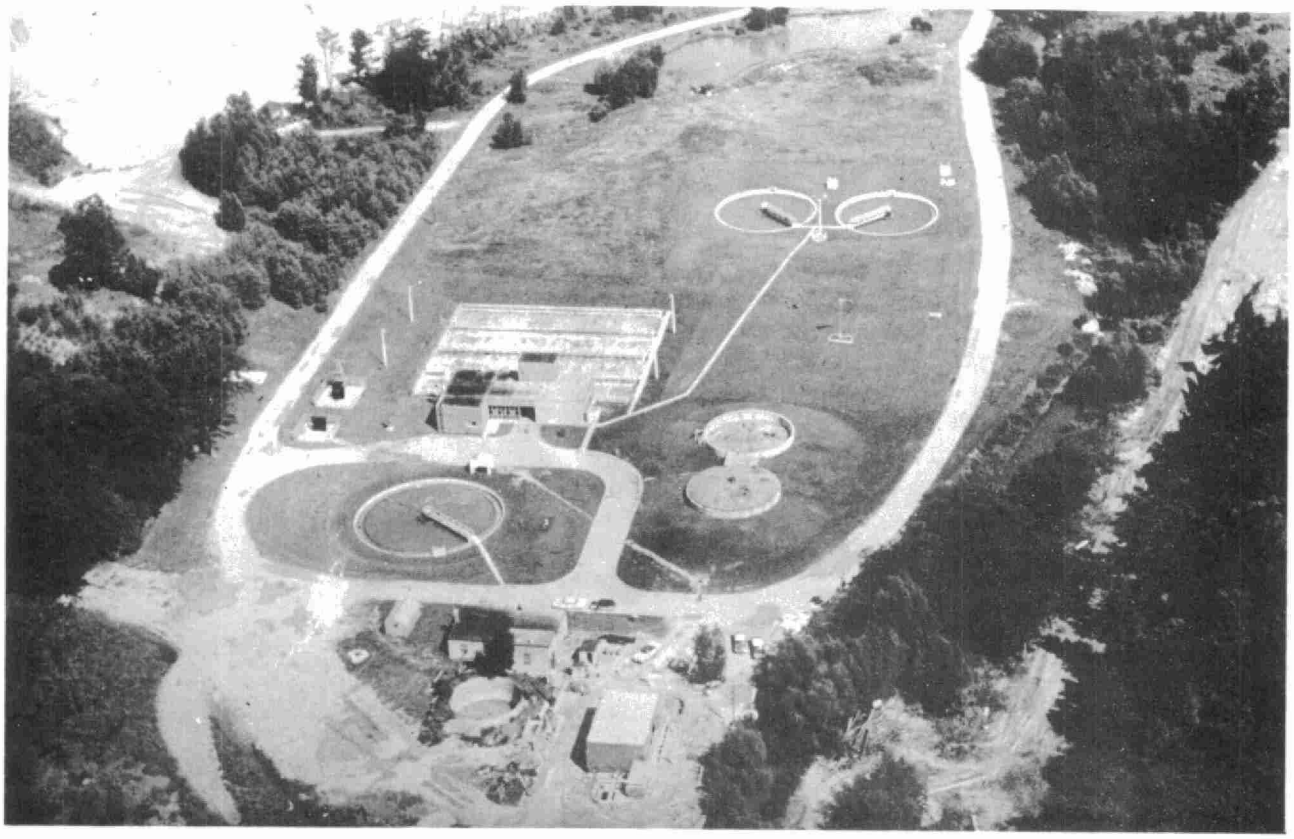
Operating Costs..... Page 20

Summary..... Page 24

Total Costs.....Inside back cover

C. W. Perry
Assistant Director
D. McTavish
Regional Supervisor
B. G. Porter
Operations Engineer

WATERLOO SEWAGE TREATMENT PLANT



OPERATED FOR

THE CITY OF WATERLOO

BY

THE ONTARIO WATER RESOURCES COMMISSION

CHAIRMAN

A. M. Snider

COMMISSIONERS

W. D. Conklin, Q. C.
J. H. H. Root, M.P.P.
J. A. Vance, LL. D.
A. A. Wishart, Q. C., M.P.P.

GENERAL MANAGER

D. S. Caverly

ASSISTANT GENERAL MANAGERS

G. M. Galimbert
L. E. Owers

COMMISSION SECRETARY

W. S. MacDonnell

1956 to 1963 History

INCEPTION

In 1956, the City of Waterloo and the Ontario Water Resources Commission initiated plans to provide secondary treatment additions to the Waterloo Sewage Treatment Plant.

The firm of Proctor and Redfern, Toronto, Ontario, Consulting Engineers, was engaged to prepare plans and specifications for the project.

APPROVAL

On January 24, 1958, the Ontario Municipal Board granted approval for the plant extensions and the city signed an agreement with the Ontario Water Resources Commission to finance, construct and operate the plant.

CONSTRUCTION

Ball Brothers Construction Company, Kitchener, Ontario, began construction in 1959 and by April of 1960, the Division of Plant Operations assumed the responsibility of operating the new plant.

TOTAL COST

$690,029.00

Project Staff

E. H. Hay,
Chief Operator

Operators:

A. Franz

R. R. Gellatly

F. Hamer

R. D. Matthews

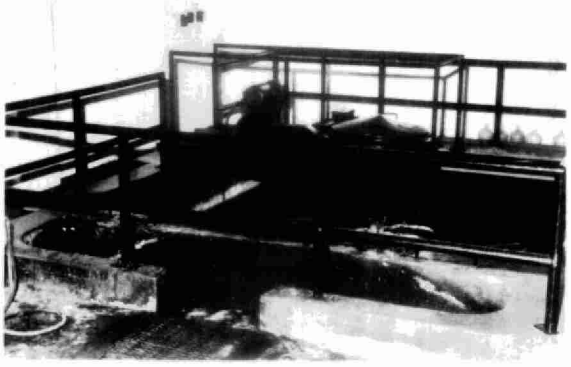
R. Sellence

B. E. Snider

The plant is staffed between the hours of 7:00 A. M. and 11:00 P. M., seven days per week. An alarm system, in operation between 11:00 P. M. and 7:00 A. M. will bring staff to the plant in the event of an emergency.

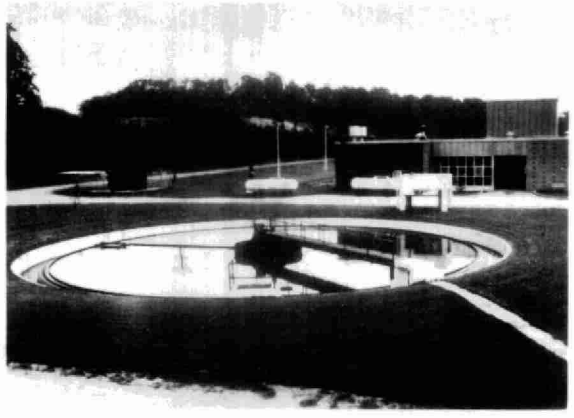
Mr. Hay and Mr. Snider received their Certificates of Qualification as Sewage Works Operators in 1963 after successfully completing a series of three one week duration courses of instruction sponsored by the OWRC. Mr. Gellatly is currently enrolled in the course and successfully completed the first series of lectures in November 1963.

Description of Project



INFLUENT WORKS

Flow enters the plant from a new pumping station located at the plant site. This station receives sewage via two trunk sewers and provides comminution. Flow enters the detritor room through a mechanically cleaned bar screen and is directed to an 18" Parshall flume where the flow quantity is measured and recorded. A twelve foot square detritor provides 30 seconds retention at design flow to remove non-organic solids. The sand and grit settled out is removed by a mechanical raking mechanism to a wheelbarrow and is buried on the plant grounds.



PRIMARY SEDIMENTATION

A 75 foot diameter concrete clarifier receives sewage from the grit removal unit. The clarifier has a 9 foot side wall depth with a 12 foot depth at the centre. A retention period of 1.66 hours at design flow allows settleable solids in the incoming sewage to settle to the bottom of the tank. A circular scraper mechanism removes the settled sludge to a central hopper from where it is pumped to vacuum filtration facilities.

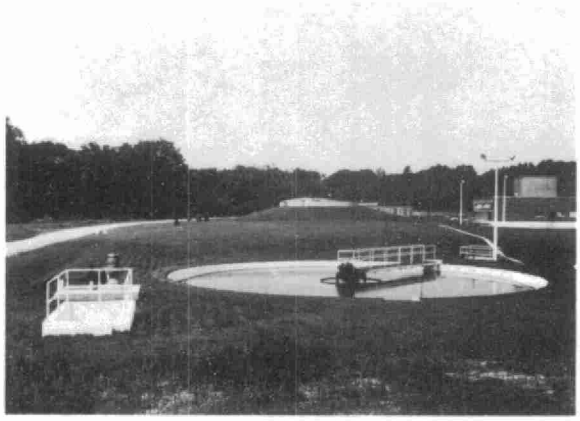
AERATION

Four single pass aeration tanks with a total volume of 1.5 million gallons provides 7.2 hours retention at design flow and 25% return sludge. Each tank is 136 ft. x 30 ft. with a 15 ft. side wall depth. Air is supplied by two air compressors each rated at 3,750 cubic feet of air per minute.

Aerobic digestion of suspended and dissolved solids results from the action of the activated sludge in the presence of oxygen.

FINAL SEDIMENTATION

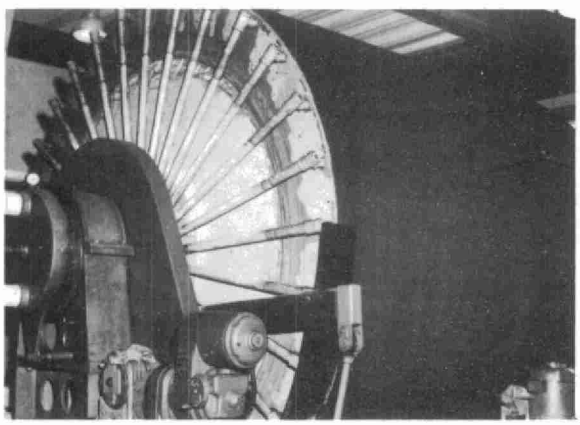
Two 65 foot diameter circular concrete final clarifiers with a 10 foot side wall depth receive the mixed liquor from the aeration section. Each tank has a volume of 230,000 Imperial gallons and together they provide 2.75 hours retention at design flow. The flocculant activated sludge settles out in these clarifiers



leaving a clear effluent which overflows a peripheral weir, is chlorinated and is directed to the Grand River.

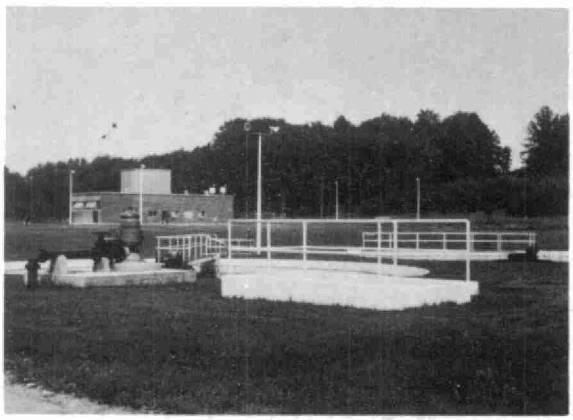
The activated sludge is collected by circular mechanisms and a portion of it is returned to feed the aeration process.

Excess activated sludge is wasted to the primary clarifier and is filtered with the raw sludge.



VACUUM FILTER

Waste activated and raw sludge are stored in the primary clarifier and pumped to the vacuum filtering unit. This unit is a 300 square foot Komline-Sanderson stainless steel coil spring vacuum filter. The filter drum is placed under a vacuum and moisture is drawn from the sludge. Lime and ferric chloride solutions are used to coagulate the sludge solids prior to filtration. The concentrated sludge is hauled to farmland and sanitary landfill areas by truck. The moisture removed is returned to the aeration section to be treated biologically.



CHLORINE CONTACT CHAMBER

Chlorination is practiced to disinfect harmful bacteria in the effluent. A chlorine residual of 0.5 PPM after 15 minutes of contact time is maintained.

Design–Data

GENERAL

Type of Plant - Activated sludge.

Design Population - 20,000.

Design Plant Flow - 4.0 MGD.

Per Capita Flow - 200 GPCD

Five Day BOD -

Raw Sewage	-	300 PPM
Removal	-	90%

Suspended Solids -

Raw Sewage	-	270 PPM
Removal	-	90%

PRIMARY TREATMENT

Screening

Dorr-Oliver mechanically cleaned bar screen.

Grit Removal

12 ft. square concrete grit chamber with Dorr-Oliver mechanical raking mechanism.

PRIMARY CLARIFICATION

One 75 ft. diameter concrete clarifier with Link Belt scraping and skimming mechanism.

Detention time - 1.66 hours @ 4.0 MGD.

SECONDARY TREATMENT

Aeration Section

Four concrete tanks 136 ft. x 30 ft. with a 15 ft. side wall depth. Air supplied from two Sutorbilt rotary compressors each rated at 3,750 cubic ft. per minute. Air supplied through 264 Walker spargers in the aeration tanks on 2 ft. c/c spacings.

Final Settling Tanks

Two 65 ft. diameter concrete tanks with 10 ft. side wall depth equipped with Dorr-Oliver scraping mechanism.

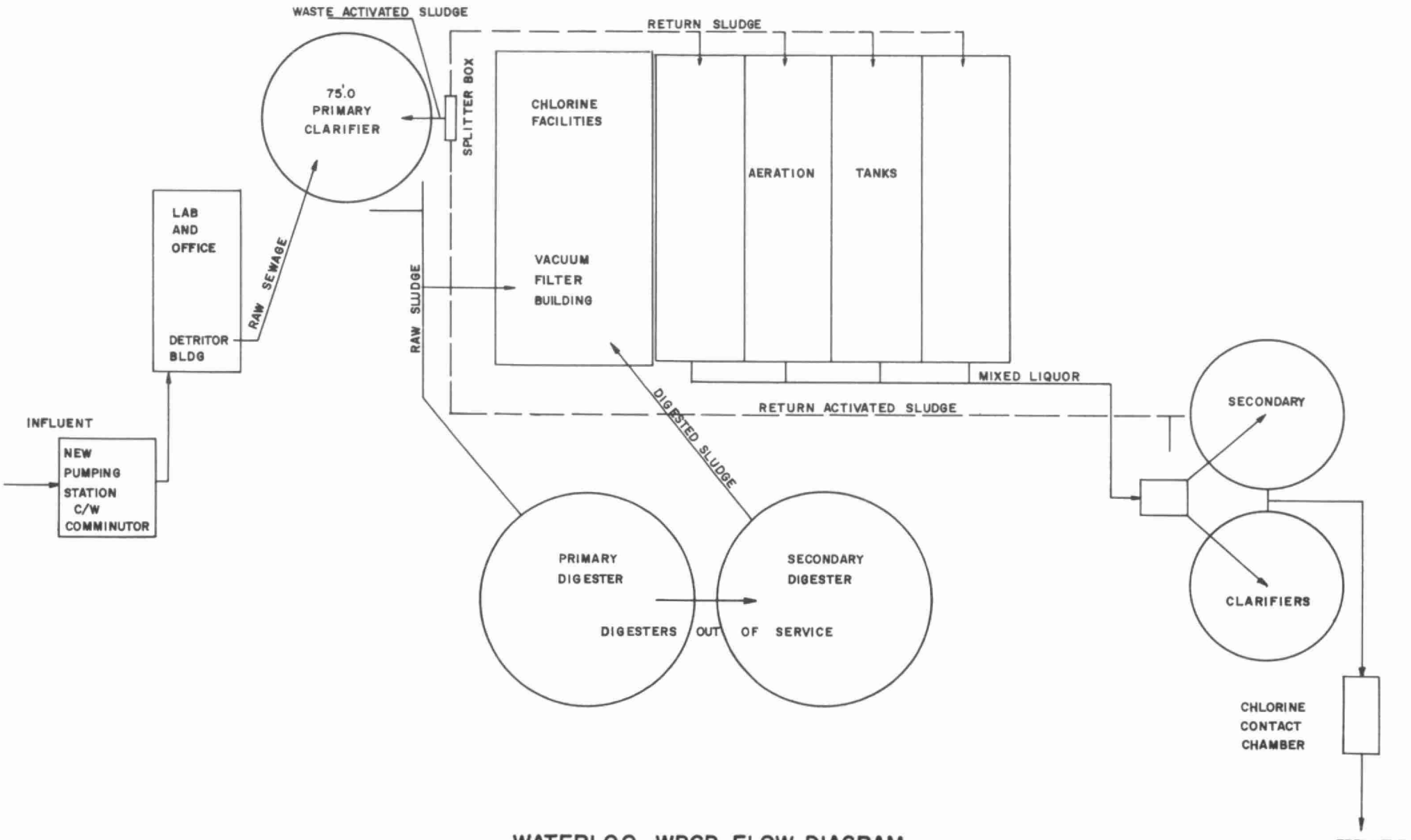
Detention time - 2.75 hours @ 4.0 MGD.

Vacuum Filtration

One 300 square ft. Komline-Sanderson stainless steel coil spring filter, together with a 13" HG vacuum pump and associated chemical storage and mixing facilities.

Chlorination

One B. L. F. 400 pounds per day chlorinizer.



WATERLOO WPCP FLOW DIAGRAM

Process Data

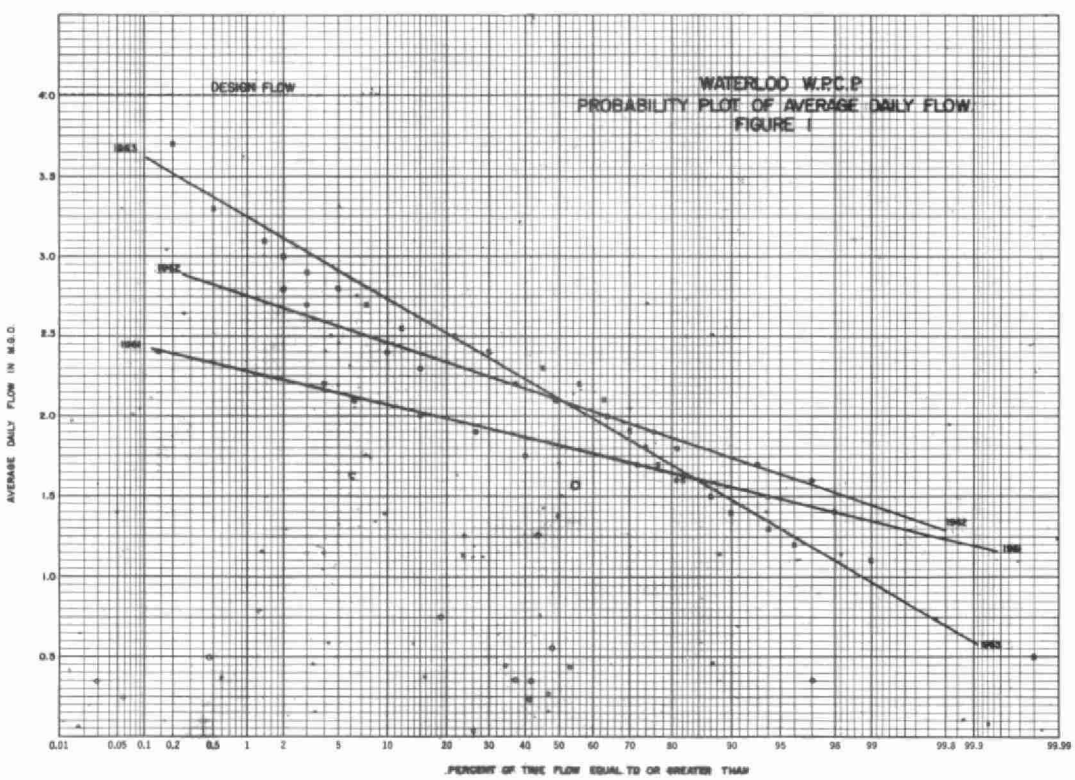
The average daily flow and the total flow for the year were slightly greater than the 1962 flows. The average daily flow during 1963 was 2.09 million gallons compared to 2.02 million gallons per day received during 1962. This is a 3.5% increase. During the past year, 762.45 million gallons of raw sewage, composed of both industrial and domestic wastes received complete treatment.

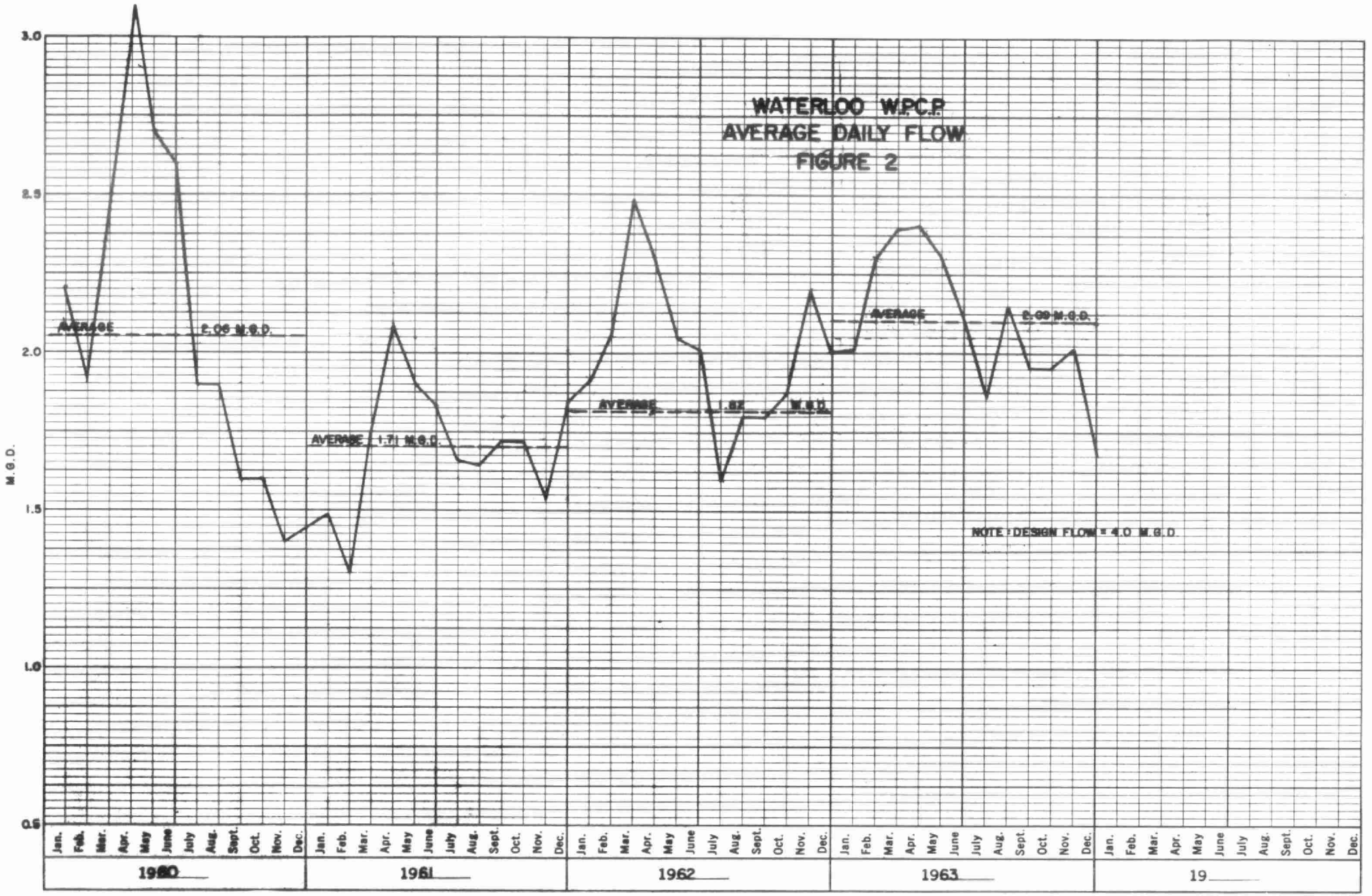
The maximum 24 hour flow in the past year was 3.77 million gallons and occurred in the month of March as did the maximum monthly average flow of 2.39 million gallons per day. A peak flow rate of 4.6 million gallons per day was received several times during the year.

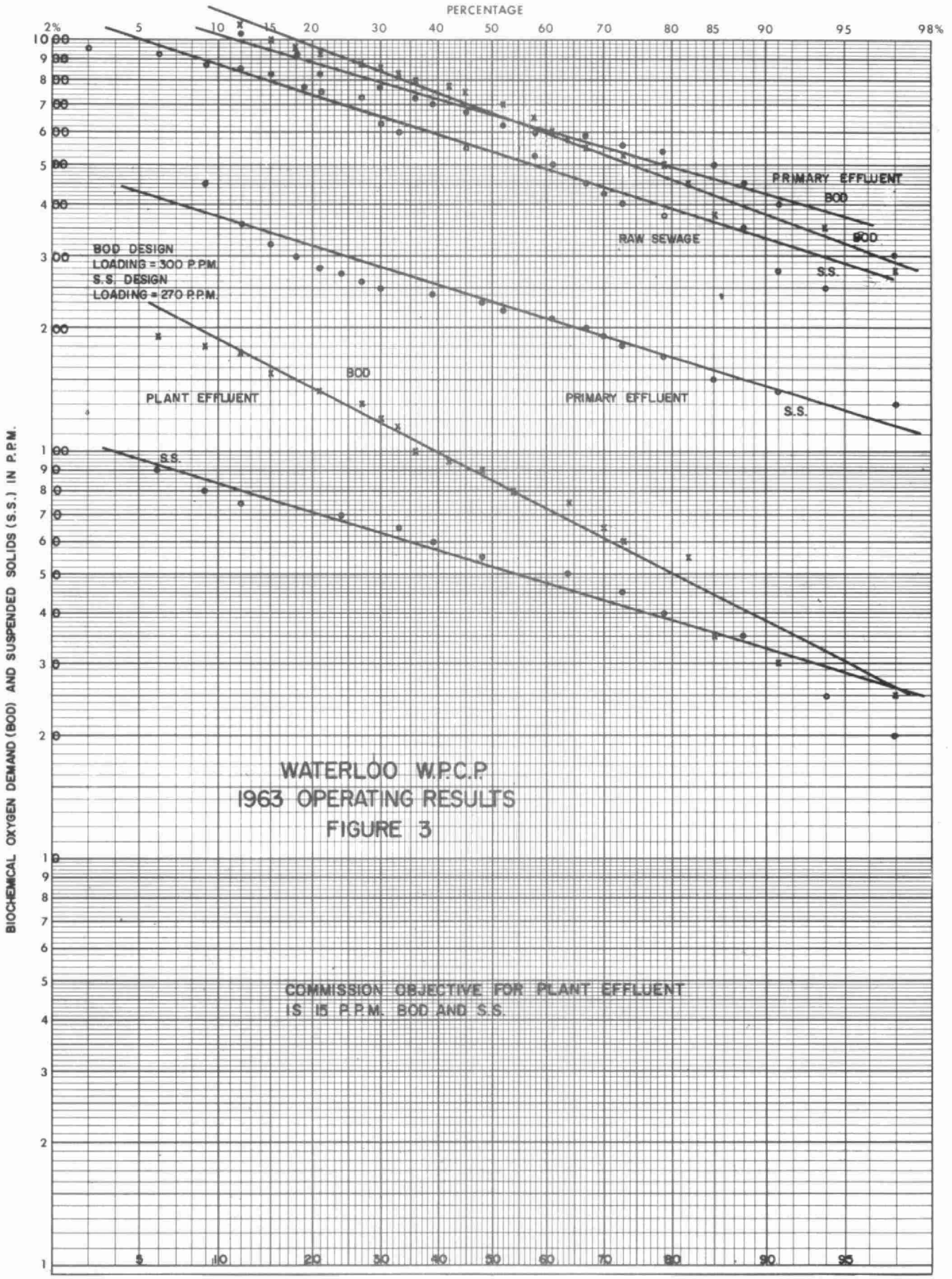
The process was, as in previous years, subjected to a widely varying pH which fluctuated from below 2 to above 12. This added greatly to the operating problems at the plant and interfered with process efficiency.

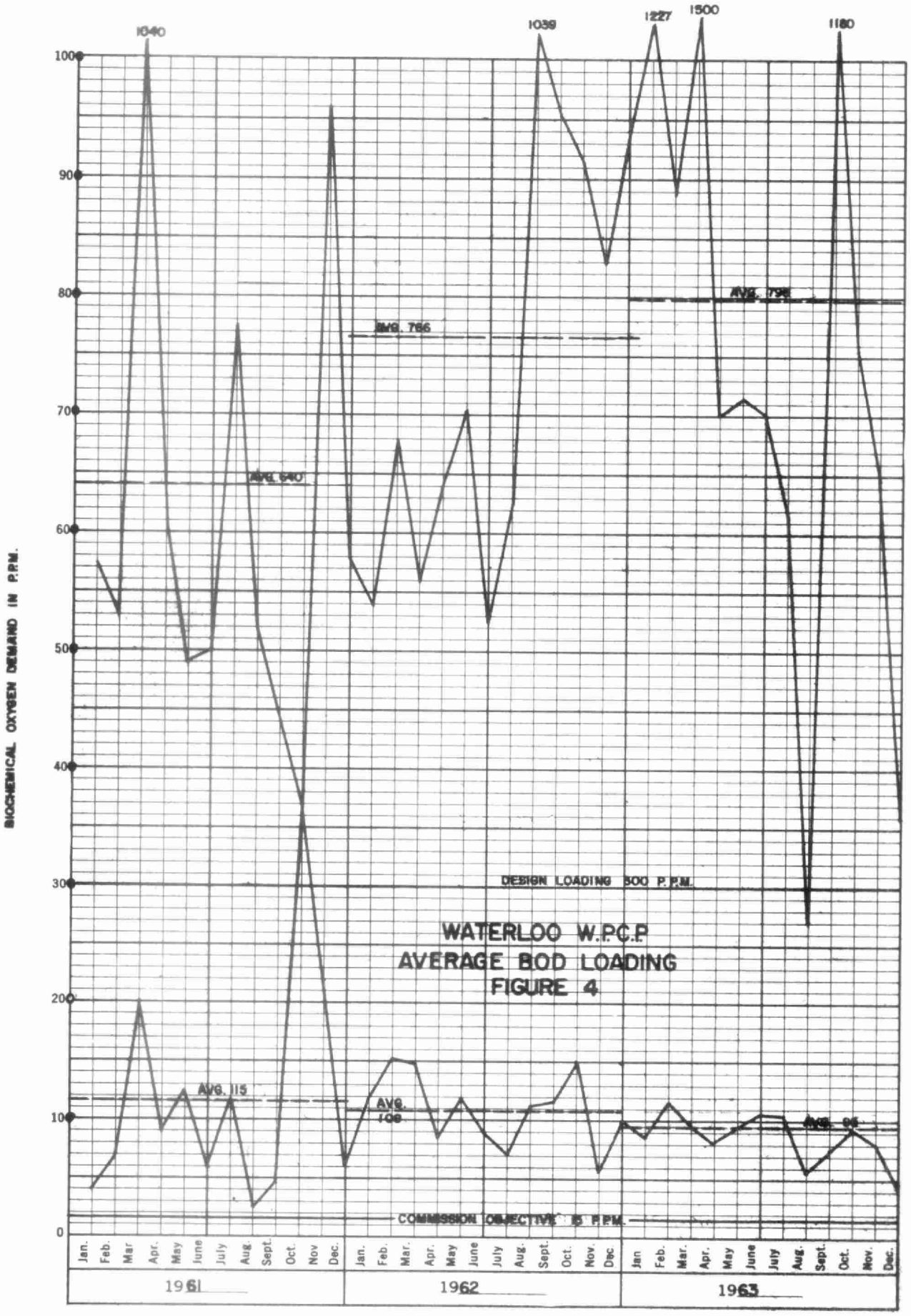
The following graphs indicate that the sewage flows are always less than the hydraulic design of 4.0 million gallons per day. This indicates that very little runoff or storm flow is picked up by the sanitary sewer system. The graphs of BOD and suspended solids loadings present a very different picture. Since 1961, the average BOD loading for any month has always been greater than the design loading of 300 PPM. Only during two months since 1961 has the average suspended solids loading been less than the design loading of 270 PPM. Indeed, on occasion, both of these loadings have surpassed five times their respective design figures.

Less than design flow combined with greater than design organic loadings have resulted in less than desirable efficiency and greater than usual operating difficulties at this plant.

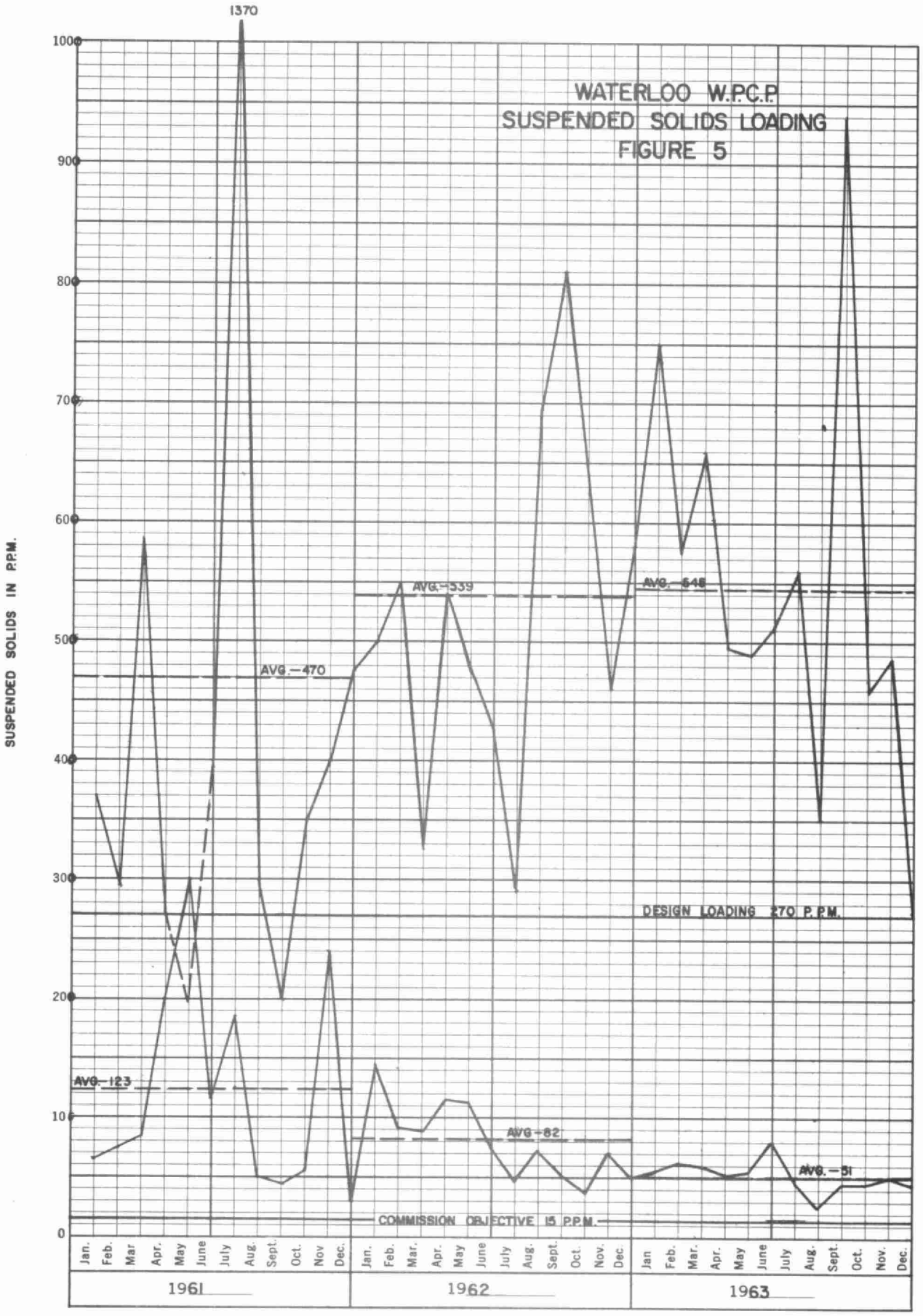



WATERLOO W.P.C.P.
AVERAGE DAILY FLOW
FIGURE 2
M.G.D.
3.0
2.5
2.0
1.5
1.0
0.5
AVERAGE 2.06 M.G.D.
AVERAGE 1.71 M.G.D.
AVERAGE 1.82 M.G.D.
AVERAGE 2.09 M.G.D.
NOTE : DESIGN FLOW = 4.0 M.G.D.
Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.
1960
1961
1962
1963
19


PERCENTAGE
2%
5
10
15
20
30
40
50
60
70
80
85
90
95
98%
BIOCHEMICAL OXYGEN DEMAND (BOD) AND SUSPENDED SOLIDS (S.S.) IN P.P.M.
PRIMARY EFFLUENT
BOD
BOD
RAW SEWAGE
S.S.
BOD DESIGN
LOADING = 300 P.P.M.
S.S. DESIGN
LOADING = 270 P.P.M.
BOD
PLANT EFFLUENT
PRIMARY EFFLUENT
S.S.
S.S.
WATERLOO W.P.C.P
1963 OPERATING RESULTS
FIGURE 3
COMMISSION OBJECTIVE FOR PLANT EFFLUENT
IS 15 P.P.M. BOD AND S.S.
PERCENTAGE OF SAMPLES EQUAL TO OR GREATER THAN



WATERLOO W.P.C.P
AVERAGE BOD LOADING
FIGURE 4


WATERLOO W.P.C.P.
SUSPENDED SOLIDS LOADING
FIGURE 5
SUSPENDED SOLIDS IN P.P.M.
1370
1000
900
800
700
600
500
400
300
200
100
0
AVG.-470
AVG.-539
AVG.-548
DESIGN LOADING 270 P.P.M.
AVG.-123
AVG.-82
AVG.-51
COMMISSION OBJECTIVE 15 P.P.M.
Jan. Feb. Mar Apr. May June July Aug. Sept. Oct. Nov Dec.
1961
1962
1963

GRIT, B.O.D AND S.S. REMOVAL

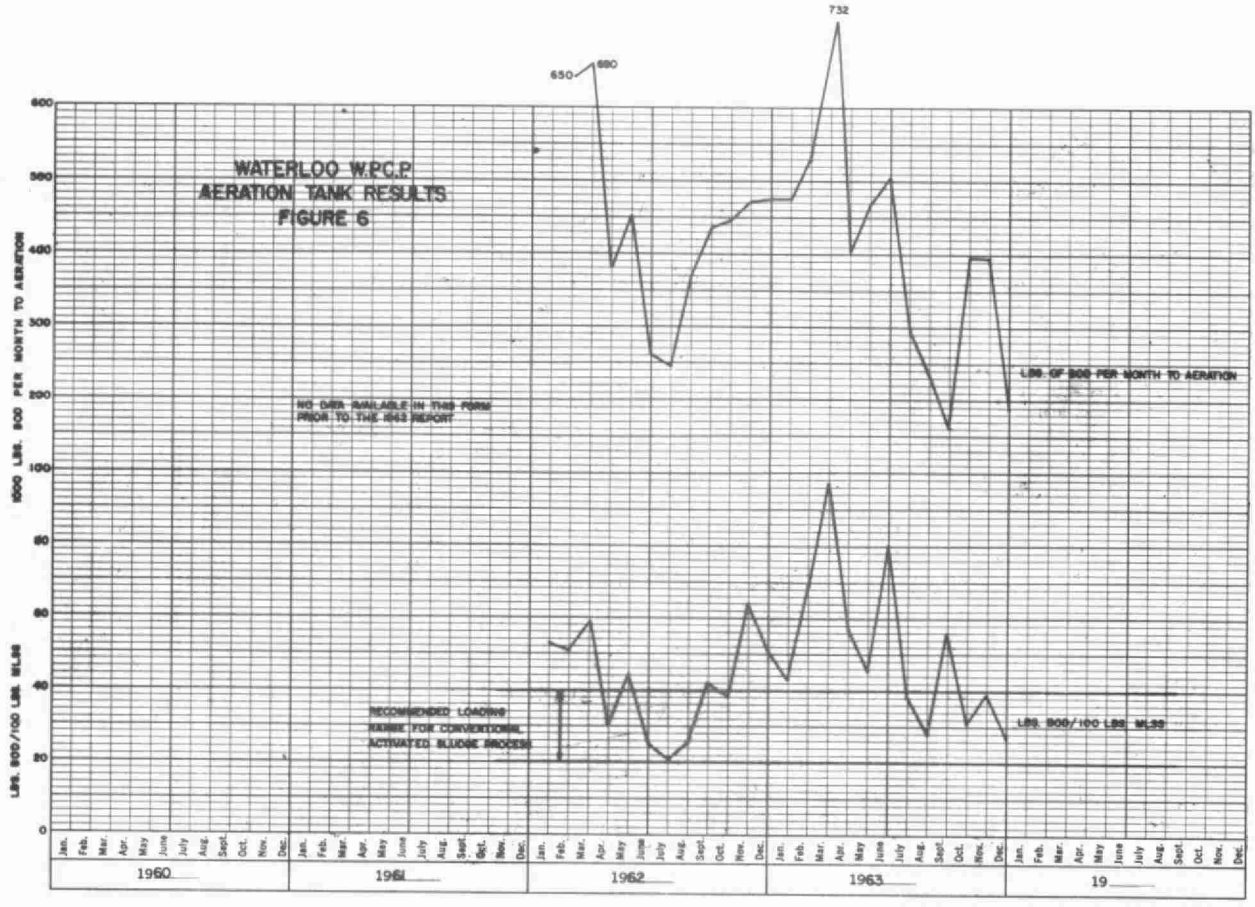
MONTH	B. O. D.				S. S.				GRIT REMOVAL CU. FT.
	INFLUENT P.P.M.	EFFLUENT P.P.M.	% REDUCTION	TONS REMOVED	INFLUENT P.P.M.	EFFLUENT P.P.M.	% REDUCTION	TONS REMOVED	
JAN.	1227	90	94.5	354.4	748	56	92.5	215.7	35
FEB.	887	115	87.0	245.2	571	62	89.0	162.3	31
MAR.	1500	96	93.5	520.3	661	58	91.0	223.5	37
APR.	704	82	88.5	224.1	496	52	89.5	159.9	100
MAY	718	94	87.0	223.1	488	54	89.0	155.2	49
JUNE	707	216	69.5	154.3	511	79	84.5	135.8	58
JULY	615	103	83.0	147.5	556	46	91.5	146.9	64
AUG.	270	56	79.0	71.3	346	.4	93.0	107.3	40
SEPT.	1180	76	93.5	323.2	940	44	95.5	262.3	41.5
OCT.	757	91	88.0	201.3	458	44	90.5	125.1	33.5
NOV.	645	79	87.5	171.0	482	49	90.0	130.8	39.5
DEC.	360	42	88.5	82.7	279	44	84.0	61.1	37.0
TOTAL				2719.4				1885.9	565.5
AVG.	798	95	88.1	226.6	545	51	90.6	157.1	47.1

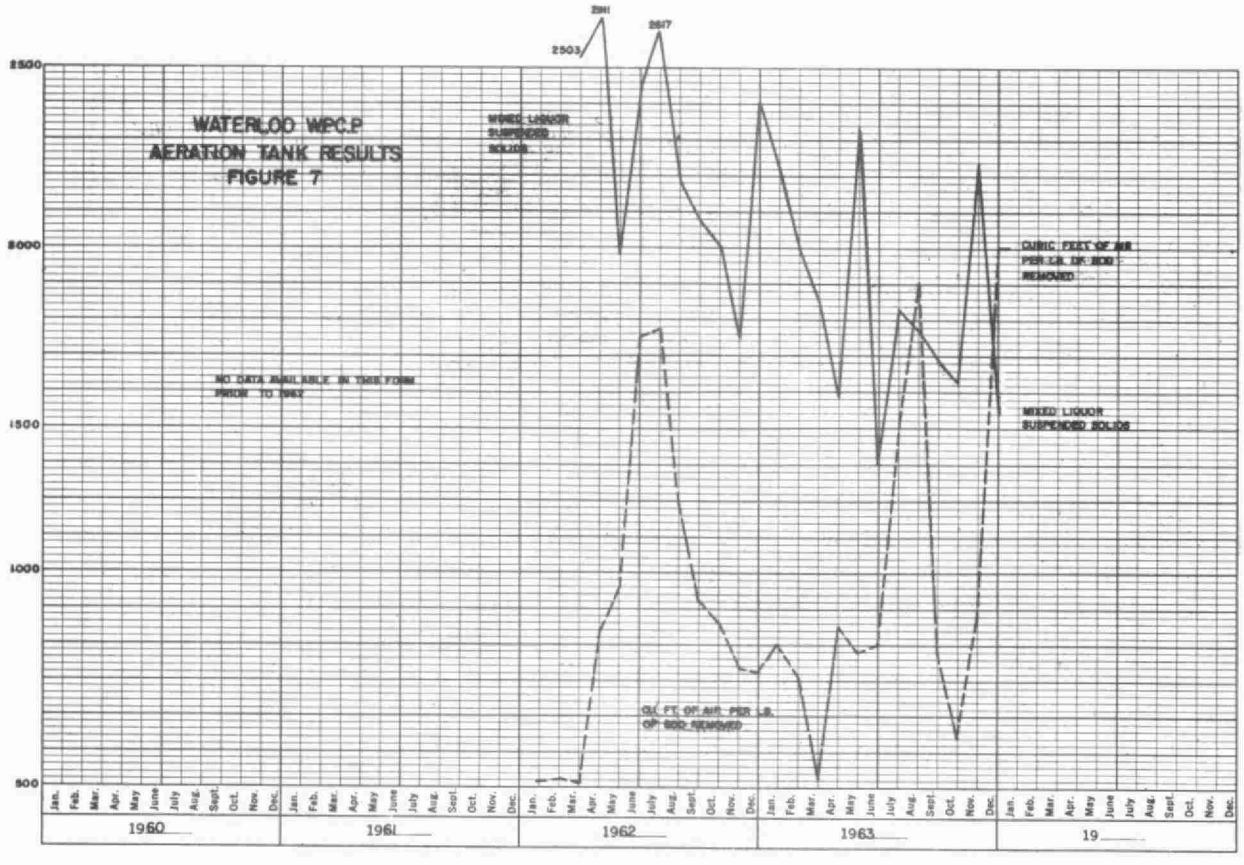
COMMENTS

The average BOD loading of 798 PPM is two and one half times the design loading of 300 PPM. An average removal of 88.1% was achieved during 1963. It would require an average of 98% removal to obtain an effluent equivalent to the Commission objective of 15 PPM.

The average suspended solids loading is two times the 270 PPM provided for in the design. The plant removed 90.6% of these solids on the average leaving an effluent containing an average of 51 PPM. The Commission objective for suspended solids is 15 PPM.

The tons of BOD and S.S. removed far exceed that quantity that it would be necessary to remove if design conditions prevailed.


WATERLOO W.P.C.P.
AERATION TANK RESULTS
FIGURE 6
1000 LBS. BOD PER MONTH TO AERATION
LBS. BOD/100 LBS. M.L.S.S.
650
680
732
NO DATA AVAILABLE IN THIS FORM PRIOR TO THE 1963 REPORT
RECOMMENDED LOADING RANGE FOR CONVENTIONAL ACTIVATED SLUDGE PROCESS
LBS. OF BOD PER MONTH TO AERATION
LBS. BOD/100 LBS. M.L.S.S.
Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.
1960
1961
1962
1963
19

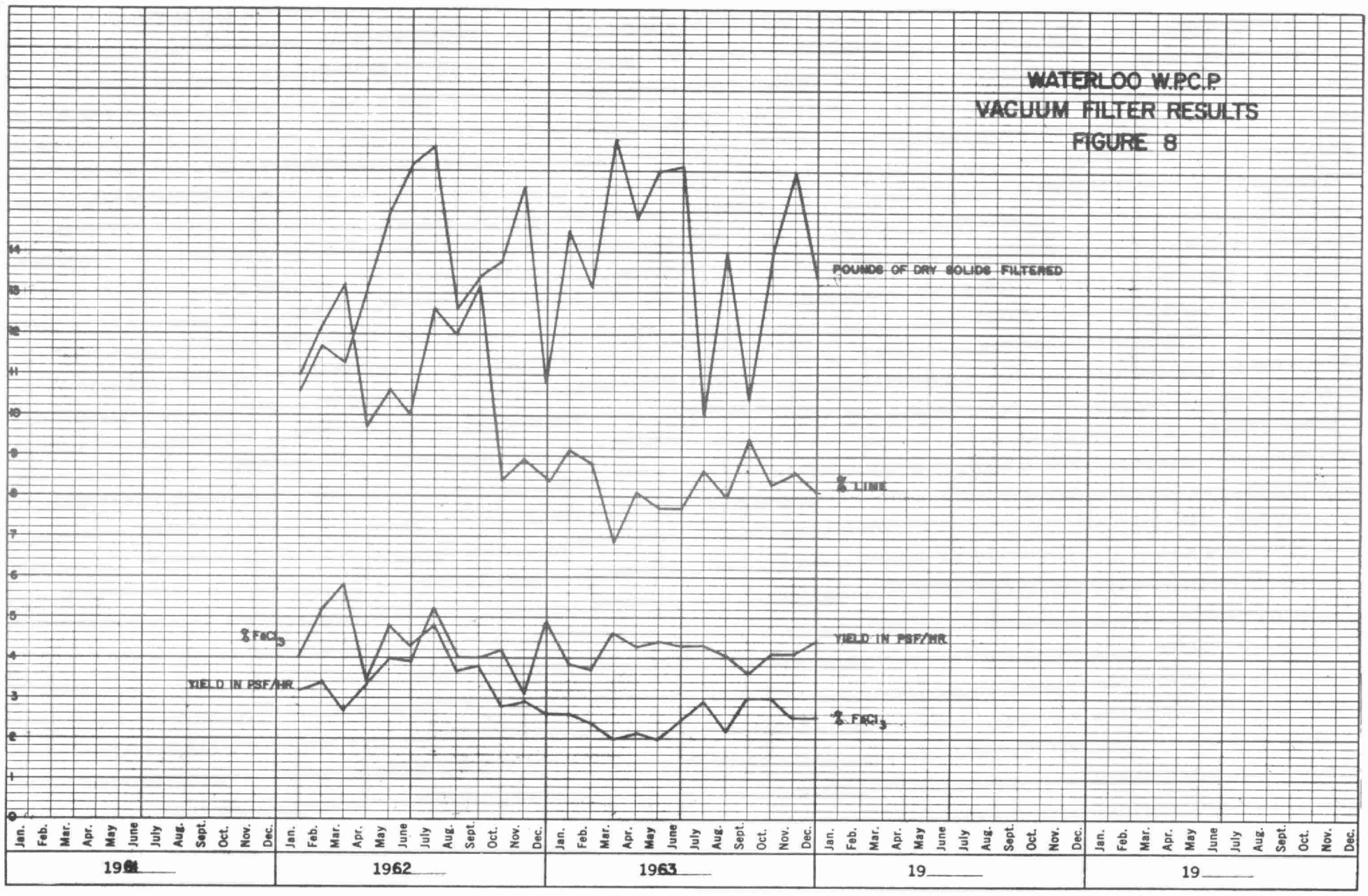

WATERLOO WPC.P
AERATION TANK RESULTS
FIGURE 7
2500
2000
1500
1000
500
2503
2911
2617
MIXED LIQUOR SUSPENDED SOLIDS
NO DATA AVAILABLE IN THIS FORM PRIOR TO 1962
CUBIC FEET OF AIR PER LB. OF BOD REMOVED
MIXED LIQUOR SUSPENDED SOLIDS
CU. FT. OF AIR PER LB. OF BOD REMOVED
Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.
1960
1961
1962
1963
19

AERATION SECTION

MONTH	PRIM. EFFL. B.O.D. P.P.M.	M.L.S.S. P.P.M.	LBS. B.O.D. PER 100 LBS. M. L. S. S.	CUBIC FEET AIR PER LB. B.O.D. REMOVED
JANUARY	763	2217	43	798
FEBRUARY	830	1997	69	704
MARCH	988	1850	97	527
APRIL	558	1590	57	951
MAY	655	1921	45	880
JUNE	797	1401	80	901
JULY	510	1731	38	1523
AUGUST	350	1673	28	1904
SEPTEMBER	700	1693	56	879
OCTOBER	655	1634	31	640
NOVEMBER	655	2239	39	971
DECEMBER	362	1544	27	2002
TOTAL	-	-	-	-
AVERAGE	652	1791	50	1057

COMMENTS

It will be noted that the primary effluent BOD averages 625 PPM. With this high loading the pounds of BOD per 100 pounds MLSS average of 50 is above the recommended value. The mixed liquor suspended solids (MLSS) is maintained at a value lower than desirable due to the inadequacy of air supply and aeration tank volume. The total air compressor capacity is being supplied to the aeration section twenty-four hours per day. The bio-sorption process is being used for maximum efficiency.


WATERLOO W.P.C.P.
VACUUM FILTER RESULTS
FIGURE 8
LBS. OF SOLIDS FILTERED x 100,000
YIELD IN LBS/SQ.FT/HOUR
POUNDS OF DRY SOLIDS FILTERED
% LIME
% FeCl3
YIELD IN PSF/HR
YIELD IN PSF/HR
% FeCl3
Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.
1961
1962
1963
19
19

VACUUM FILTER OPERATION

MONTH	FILTER HOURS		% SOLIDS RAW SLUDGE	LBS. DRY SOLIDS FILTERED	LBS. LIME	% LIME	LBS. $FeCl_3$	% $FeCl_3$	% SOLIDS FILTERED SLUDGE	YIELD PSF/HOUR
	#1	#2								
JAN.	312.5		4.9	377,787	48,850	9.1	9523	2.6		3.9
FEB.	282.5		5.1	327,597	40,190	8.8	7993	2.4		3.7
MAR.	296.5		5.6	418,754	39,450	6.9	8226	2.0		4.6
APR.	284.0		5.2	369,247	42,300	8.1	7748	2.1		4.3
MAY.	301.0		5.2	398,495	43,750	7.7	8049	2.0		4.4
JUNE	305.0		5.1	404,660	44,900	7.7	10303	2.5		4.3
JULY	183.0		5.2	250,013	28,350	8.6	7110	2.9		4.3
AUG.	282.0		4.7	347,386	38,950	8.0	7947	2.2		4.1
SEPT.	239.5		4.3	261,715	35,000	9.4	7938	3.0		3.6
OCT.	277.5		4.9	354,362	41,900	8.3	10, 222	3.0		4.1
NOV.	324.0		4.7	400,663	48,050	8.6	10, 063	2.5		4.1
DEC.	244.0		5.4	331,351	37,250	8.1	8185	2.5		4.4
TOTAL	3331.5			4242,030	488,940		103,307			
AVG.	277.6		5.0	353,502	40,745	8.3	8609	2.5		4.1

COMMENTS

During 1963, the filter was operated about 278 hours per month, or 70 hours per week and 2,121 tons of dry solids were filtered. Using an average solids content of 15% in the filtered sludge, this weight of dry solids represents 14,140 tons of sludge which was hauled away by truck.

Assuming the filtered sludge solids content is 15%, the moisture content of the sludge was reduced from 95% to 85% by the vacuum filter. This represents a 66% reduction in the volume of sludge to be hauled.

The ferric chloride and lime dosages are well within the ranges reported by others for this type of sludge. The yield also compares favourably with those of other plants and is indicative of an efficient filter operation.

CHLORINATION

MONTH	PLANT FLOW (MG)	POUNDS CHLORINE	DOSAGE RATE (P.P.M)
JANUARY	62.342		
FEBRUARY	63.786		
MARCH	74.113		
APRIL	72.064		
MAY	71.527		
JUNE	62.876		
JULY	57.637		
AUGUST	66.668		
SEPTEMBER	58.557		
OCTOBER	60.445	6500	10.8
NOVEMBER	60.425	4748	7.9
DECEMBER	52.006	5475	10.5
TOTAL	762.446	16723	
AVERAGE	63.537	5574	9.7

COMMENTS

Final effluent chlorination was not practiced in the past at this plant because it was not possible to chlorinate at other sewage treatment plants in the area. This situation no longer existed after October 1963.

Year-round chlorination of the final effluent will be carried out in the future as per recommendations of the Division of Sanitary Engineering.

1963

PLANT — **Total Operating Costs** — **MONTHLY**

MONTH	TOTAL EXPENDITURE	PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICAL	GENERAL SUPPLIES	EQUIPMENT	REPAIRS & MAINTENANCE	SUNDRY	TRAVEL ~~WATER~~
JAN	5883	2413		492	1505	721	44			690	17
FEB	7403	2417		524	1851	1566	301	(123)	131	720	16
MARCH	7071	2469		293	1702	1818	110		6	617	54
APRIL	6753	2463		235	1552	965	648		759	71	61
MAY	6287	2417			1497	812	144	138	191	985	102
JUNE	13251	3104		261	1467	1836	53		415	6077	38
JULY	9740	3625	418		1617	2449	292	4	463	721	150
AUG	4707	2389	307		1568	45	228		78	41	48
SEPT	8265	2465	294		1585	2207	175		476	1008	54
OCT	5803	2417	201		1628	426	106		406	488	96
NOV	11,095	2347		91	1650	6031	147	16	177	581	55
DEC	10153	3647	374		1628	3250	299		202	649	104
TOTAL	96,410	32,173	1,594	1,896	19,252	22,163	2,548	36	3,305	12,648	796

PLANT — **YEARLY**

YEAR	M.G. TREATED	TOTAL COST	COST PER MILLION GALLONS	COST PER CAPITA PER YEAR	COST PER TON OF BOD REMOVED
1961	599,373	$ 80,710	$134.25	$ 3.64	---
1962	736,953	86,442	117.00	3.89	$36.00
1963	762,446	96,410	126.50	4.07	39.13

BASED ON 1963 ASSESSED POPULATION OF 23,401

VACUUM FILTER COSTS MONTHLY

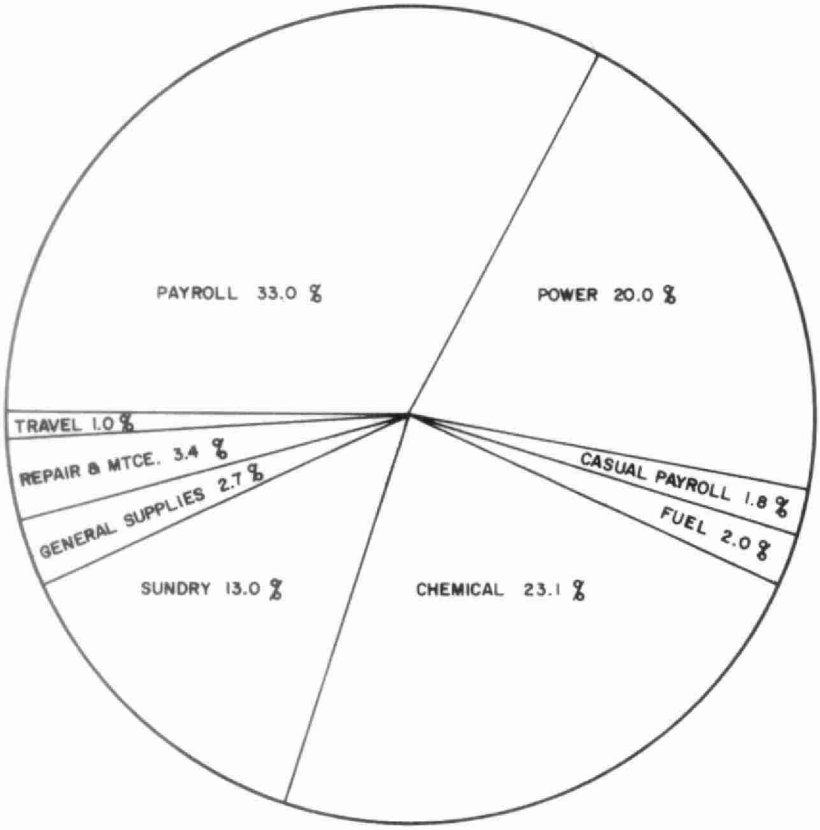
MONTH	COST PER MONTH					ACCUMU-LATIVE TOTAL	COST PER TON DRY WEIGHT					ACCUMU-LATIVE TOTAL
	$FeCl_3$	LIME	LABOUR	ELEC	MAINT		$FeCl_3$	LIME	LABOUR	ELEC	MAINT	
JANUARY	685	537	625	110	25	1,982	3.62	2.84	3.31	0.58	0.13	10.48
FEBRUARY	575	441	565	110	25	1,716	3.40	2.61	3.34	0.65	0.15	10.15
MARCH	592	434	593	110	25	1,754	2.33	2.07	2.83	0.52	0.12	7.87
APRIL	557	465	568	110	25	1,725	3.01	2.51	3.07	0.60	0.14	9.33
MAY	580	481	602	110	25	1,798	2.91	2.42	3.02	0.55	0.13	9.03
JUNE	815	494	610	110	25	2,054	4.04	2.45	3.02	0.55	0.12	10.18
JULY	512	312	366	110	25	1,325	4.09	2.49	2.93	0.88	0.20	10.59
AUGUST	572	428	564	110	25	1,699	3.28	2.46	3.24	0.63	0.14	9.75
SEPTEMBER	570	385	579	110	25	1,669	4.35	2.94	4.42	0.84	0.19	12.74
OCTOBER	736	461	555	110	25	1,887	4.16	2.61	3.14	0.62	0.14	10.67
NOVEMBER	725	528	648	110	25	2,036	3.63	2.64	3.24	0.55	0.12	10.18
DECEMBER	590	410	488	110	25	1,623	3.56	2.47	2.95	0.66	0.15	9.79
TOTAL	7509	5376	6763	1320	300	21,268						
AVERAGE PER MONTH	626	448	564	110	25	1,773	3.53	2.54	3.21	.64	0.14	10.06

COMMENTS

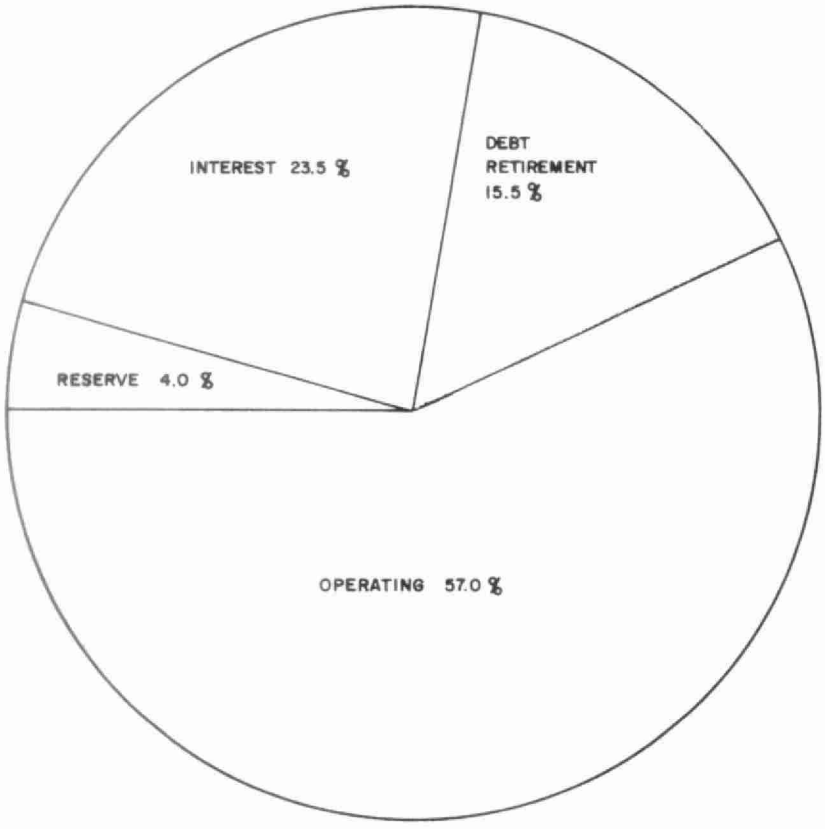
Vacuum filtration operation during 1963 cost $21,268.00 or $10.06 per ton of dry solids.

WATERLOO WPCP

1963 OPERATING COSTS



1963 TOTAL ANNUAL COSTS



COSTS

The operating costs for the plant are considerably higher than those associated with plants of a similar size. This reflects the unusually high organic content of the sewage. Operating costs would be increased even further if it were possible to remove more of the pollutants from the sewage. The cost per million gallons of sewage at Waterloo was $126 as compared to an average cost of $60 for three other plants of the same type and size, but which receive a normal domestic waste. If these plant costs are compared on the basis of BOD removed, then there is a much closer relationship. The cost per ton of BOD removed at Waterloo was $39 while the average cost for the three other plants was $57.

Therefore, the cost of operation of the Waterloo plant compares favourably with those of equivalent plants with respect to the amount of organic material removed. However, the overall cost of operation is much in excess of equivalent plants due to the high concentrations of BOD and suspended solids in the waste.

SUMMARY

This report has given in detail significant data on the operation of the various treatment units at the Waterloo Sewage Treatment Plant.

With an average flow of 2.09 million gallons and a maximum 24 hour flow of 3.77 million gallons, the plant is well below the hydraulic design of 4.0 MGD. It can be seen from the average daily flow graph that there has been a small but steady increase in flow over the past three years, i.e. from 1.71 to 1.82 to 2.09 for 1961, 1962 and 1963. This is not uncommon and reflects the growth and development of the City of Waterloo.

The organic loading and pH fluctuations at this project were completely beyond the capability of the plant throughout 1963. As has been mentioned, since 1961 the average BOD loading for any month has always been greater than the design loading of 300 PPM. The average suspended solids loading during 1963 was twice design. On several occasions both the BOD and suspended solids loadings have exceeded five times their respective design figures.

The high organic loadings have resulted in high volumes of excess activated sludge in the process. Part of the excess activated sludge, which is normally wasted to the primary clarifier, had to be directed to the receiving stream with the plant effluent. This, of course, is an extremely undesirable situation and places an unusually heavy pollution load in the Grand River.

The average BOD and suspended solids removal of 88% and 90% respectively indicates that the plant is operating reasonably well with regard to its efficiency. The plant effluent, however, falls far short of the Commission objective of 15 PPM BOD and suspended solids.

The operating costs for the plant have continued to increase due to the increased cost of labour, supplies and maintenance. Maintenance costs are rising at a rapid rate because all of the equipment is called upon to give heavy-duty operation.

The plant staff, under the supervision of head office engineers, constantly attempt to get the most efficient treatment under the prevailing conditions.

RECOMMENDATIONS

This report has demonstrated the extremely overloaded condition which the Waterloo Sewage Treatment Plant is forced to operate under, and it is to be hoped that all those concerned will lend their support to an immediate plant enlargement.

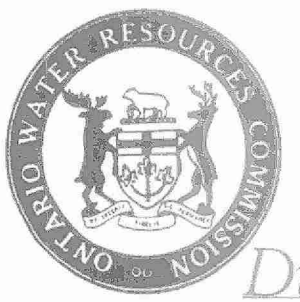
Total 1963 Costs

The total cost to the municipality during 1963 was as follows:

Operating	$ 99,407.66
Debt Retirement	$ 26,933.00
Reserve	$ 6,253.00
Interest	$ 41,654.25
TOTAL	$ 174,247.91

Note: The [illegible] as of December 31, 196[illegible]

On the ba[illegible]1, the total annual cost of th[illegible]ximately $7.45 per person.



Division of Plant Operations

ONTARIO WATER RESOURCES COMMISSION
801 BAY ST. TORONTO 5